

CLAIMS

1. A device (9) for holding in orientation, around a reference axis (16), a flat cam (3) with ovoid peripheral contour (4) perforated by an orifice (5) through which there can be passed a tubular shaft (2) whose axis then coincides with the said reference axis, in view of fixation of the said cam on the said shaft by expanding this shaft, characterized in that it is provided with:

- a body (17) provided with a transverse passage (20) for the said shaft (2) and with a conduit (21) for introduction of the said cam (3), the said introduction conduit (21) opening at one end into the said transverse passage (20) and at the other end at the periphery of the said body (17);
- means (23) for holding the said cam (3) in its introduction conduit (21) in a waiting position in which its orifice (5) is at least approximately coaxial with the said transverse passage (20);
- two first sliding blocks (32), spaced apart and parallel, interlockingly mounted to move translationally in the said body (17) in a manner that is at least substantially orthogonal to the said transverse passage (20) for the said shaft (2), the said first sliding blocks (32) being elastically spread apart from the said transverse passage by first elastic means (33), with their external ends projecting outside the said body (17) on one side thereof and their internal ends disposed facing a part of the ovoid contour (4) of the said cam (3) when this is in the said waiting position;
- two second sliding blocks (37), spaced apart and parallel, in mirror-image relationship to the said first sliding blocks (32) and interlockingly mounted to move translationally in the said body (17), in a manner that is at least substantially orthogonal to the said transverse passage (20) for the said shaft (2), the said second sliding blocks (37) being elastically spread apart from the said transverse

passage (20) by second elastic means (38), with their external ends projecting outside the said body (17) on the other side thereof, and their internal ends disposed facing another part of the ovoid contour (4) of the said cam (3) when this is in the said waiting position; and

a mechanical linkage (40) connecting the said first and second sliding blocks such that, when the said first sliding blocks (32) are pressed against the action of the said first elastic means (33) to displace the internal ends of the said first sliding blocks toward the said part of the ovoid contour (4) of the said cam (3) until contact is made therewith, the said second sliding blocks (37) are pressed by the said mechanical linkage (40) against the action of the said second elastic means (38) to displace the internal ends of the said second sliding blocks (37) toward the said other part of the ovoid contour (4) of the said cam (3) until contact is made therewith.

2. A device according to claim 1,

characterized in that the lengths of each of the said first and second sliding blocks (32, 37) are determined by the contour (4) of the said cam (3) and by the angular orientation thereof around the said shaft (2).

3. A device according to claim 2,

characterized in that the first and second sliding blocks (32, 37) are adjustable in length.

4. A device according to one of claims 1 to 3,

characterized in that the spacing between the said first sliding blocks (32) and the spacing between the said second sliding blocks (37) are determined by the contour (4) of the said cam (3) and by the angular orientation thereof around the said shaft (2).

5. A device according to any one of claims 1 to 4,  
characterized in that the internal ends of the said first and second sliding blocks (32, 37)  
are provided with rolling members (34) for contact with the peripheral contour (4) of the  
said cam (3).

6. A device according to any one of claims 1 to 5,  
characterized in that the said means (23) for holding the said cam (3) in waiting position  
in its introduction conduit (21) comprise a pressing pad (24) pressed elastically toward  
a reference plate (26) interlocked with the said device, the said pressing pad being  
spread apart elastically from this reference plate during introduction of the said cam (3)  
flatly between the said pressing pad (24) and the said reference plate (26).

7. A device according to claim 6,  
characterized in that the said means (23) for holding the cam are provided with a stop  
system (29) against which the said pressing pad (24) is pressed elastically when no cam  
(3) is in waiting position, this stop system imposing, between the said pressing pad and  
the said reference plate, a minimum spacing ( $e$ ) smaller than the thickness (E) of the  
said cam.

8. A device according to one of claims 6 or 7,  
characterized in that the said pressing pad (24) is provided with a chamfer (30) on which  
the said cam (3), during its displacement toward its waiting position in the said  
introduction conduit (21), exerts a pressure that causes the said pressing pad (24) to be  
spread apart elastically relative to the said reference plate (26).

9. A device according to any one of claims 6 to 8,  
characterized in that the said cam-holding means (23) form a mechanical unit inserted  
and fixed in the said introduction circuit (21).

10. A device according to any one of claims 1 to 9,  
characterized in that the said body (17) has the form of a thick plate with parallel faces  
(18, 19).

11. A device according to claim 10,  
characterized in that the slideways (31) for the said first and second sliding blocks (32,  
37) are machined in a first (18) of the said parallel faces of the said plate, while the said  
introduction conduit (21) is machined only partly in this same first face (18), the second  
face (19) of the said plate being machined to form partly the introduction conduit (21) of  
another plate, whose first face (18) would be applied against the said second face (19)  
of the said plate.

12. A die for production, by expanding, of a tubular camshaft, especially for an  
internal combustion engine, the said cams (3) being distributed along the said shaft (2)  
with specific orientations,

characterized in that it is provided with as many devices (9) specified under any one of  
claims 1 to 11 as the said shaft has cams, the said devices being assembled one after  
another in such a way that their transverse passages (20) are aligned to form a channel  
(22) for the said tubular shaft (2) and in such a way that their cam-introduction conduits  
(21) are disposed respectively at the position of a cam (3) along the said shaft (2).

13. A die according to claim 12, composed of a succession of devices such as  
those specified under one of claims 10 or 11,  
characterized in that the thickness of the thick plate constituting the body (17) of each  
device (9) is determined by the positions to be occupied by the said cams (3) along the  
said shaft (2).

14. A die according to claim 12, composed of a succession of devices such as those specified under one of claims 10 or 11, characterized in that the bodies (17) of all of the devices (9) have identical thickness, and in that thickness shims designed to be interposed between the said devices are provided to ensure correct correspondence with the positions to be occupied by the said cams (3) along the said shaft (2).

15. A machine for production, by expanding, of a tubular camshaft, especially for an internal combustion engine, the said cams (3) being distributed along the said shaft (2) with specific orientations, characterized in that it is provided with at least one die (1) such as that specified under one of claims 12 to 14 and with a single actuating member (44) for commonly pressing all of the said first sliding blocks (32) of the said die, the said actuating member being mounted on the said machine independently of the said die (1).

16. A machine according to claim 15, characterized in that it is provided with a stop for blocking, during the expanding operation, one end of the said tubular shaft (2) passing through the said cams (3), the said stop being mounted on the said machine, independently of the said die (1), facing the said channel (22) for the said tubular shaft (2).

17. A machine according to one of claims 15 or 16, characterized in that it is equipped with at least two such dies (1), each able to move from at least one cam-loading station to at least one expanding station then, after discharge of the expanded camshaft, from the said expanding station to the said loading station.